

FOLDABLE PORTABLE CELLULAR PHONE

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates to a foldable portable cellular phone and more particularly to the foldable portable cellular phone so configured as to maintain a state of being able to receive a
10 telephone call even while the foldable portable cellular phone is folded.

The present application claims priority of Japanese Patent Application No. 2000-241715 filed on August 9, 2000, which is hereby incorporated by reference.

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Description of the Related Art

A foldable portable cellular phone as a kind of portable cellular phone has come into widespread use (the foldable portable
20 cellular phone hereinafter may be simply referred to as a "portable cellular phone"). Figure 11A and Fig. 11B are schematic perspective views of an appearance of a conventional foldable portable cellular phone. As shown in Fig. 11A, the conventional portable cellular phone is so constructed that its main body 51 having a speech function
25 is integrally connected to a lid body 52 through a hinge 53 and that the lid body 52 can be rotated around the hinge 53 relative to the main body 51. While a telephone call is in progress, as shown in Fig. 11A, the lid body 52 is opened relative to the main body 51 and, while the telephone call is not in progress, as shown

in Fig. 11B, the lid body 52 is folded.

The main body 51 is provided with a transmitting and receiving antenna 54 configured so as to be freely expandable and contractible, a receiver 55, a display 56, an information inputting key 57, and
5 the lid body 52 is provided with a transmitter 58. The conventional foldable portable cellular phone having such configurations as above, since its size can be reduced by folding the lid body 52 while the telephone call is not in progress and therefore the portable cellular phone can be easily put in a pocket, bag, or
10 a like and can provide portability to a user in particular.

One example of such the foldable portable cellular phone as described above is disclosed in Japanese Patent Application Laid-open No. 2000 - 69158. The disclosed portable cellular phone is configured so that, while the portable cellular phone is being
15 folded, howling that occurs possibly due to an approach between transmitter and receiver can be prevented and so that operation of the portable cellular phone is halted to reduce current consumption. Generally, the foldable portable cellular phone is configured so that a state of being able to receive a call is
20 maintained even while the portable cellular phone is being folded unless power is turned OFF. However, in the above disclosed portable cellular phone, its operation is halted while the portable cellular phone is being folded, which causes half its use value to be lost.

Therefore, generally, in the foldable portable cellular
25 phone, since, while the portable cellular phone is being folded, an incoming sound rings at a time of receipt of a call, even if the portable cellular phone is being put in the pocket, bag, or the like so long as the power is ON, a user can come to know that the portable cellular phone has received a telephone call. This

can provide convenience to the user.

However, the conventional foldable portable cellular phone has problems in that, in a state in which contents displayed on a screen of the portable cellular phone can not be seen, it is
5 difficult for the user to identify transmitters of telephone calls that have been stored as a history of incoming calls and that have not yet been responded to by the user. In the conventional foldable portable cellular phone, as described above, since the state of being able to receive a call is maintained even while the portable
10 cellular phone is being folded unless the power is turned OFF, even when the portable cellular phone is put in the pocket, bag, or the like, the incoming sound rings at the time of the receipt of the call, thus informing the user of the receipt of the telephone call from someone. However, since the user cannot see contents
15 displayed on the screen of the portable cellular phone while the portable cellular phone is being folded, the user can not identify the transmitters, that is, transmitters of the telephone calls to which a response is not made. Therefore, to identify the transmitter of the incoming call, the user has to take out the
20 portable cellular phone from the pocket, bag, or the like whenever the portable cellular phone receives the incoming call and also has to open the lid body to view the contents displayed on the screen of the portable cellular phone, which causes handling of the portable cellular phone to be complicated.

25 Furthermore, in a case of users with visual impairments, even while the lid body of the foldable cellular phone is being opened, they can not read the displayed contents. This is actually the same as the above case in which the displayed contents cannot be seen because the portable cellular phone is folded, thus making

it difficult for such users to identify the transmitter of the incoming calls. Accordingly, emergence of a foldable portable cellularphone is expected which enables the user to easily identify the transmitters of the incoming calls stored as the history of incoming calls being remained unresponded to even while the user is in a state of being unable to see contents displayed on the screen of the portable cellular phone.

SUMMARY OF THE INVENTION

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In view of the above, it is an object of the present invention to provide a foldable portable cellular phone which enables a user to identify a transmitter of a telephone call that has been stored as a history of incoming calls being remained unresponded to even when the user is in a state of being unable to view a content displayed on a screen of the foldable portable cellular phone.

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According to a first aspect of the present invention, there is provided a foldable portable cellular phone being constructed integrally of a main body with a speech function and of a lid body and, in a manner that the lid body is foldable relative to the main body and of a screen to display operational contents, including:

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a telephone information registering unit on which a plurality of kinds of incoming sounds each being assigned so as to be associated with each of a plurality of transmitters of incoming calls expected to be transmitted is pre-registered;

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a control section to store, when an incoming call that arrived while the foldable portable cellular phone was folded has not yet been responded to, incoming call history information about a

transmitter of the incoming call, into an incoming call history storing area in a storing unit:

a switch having functions of searching for the incoming history storing area in the telephone information registering unit and in the control section and of outputting an incoming sound corresponding to the transmitter of the incoming call; and

wherein, when the incoming call that arrived while the foldable portable cellular phone was folded has not yet been responded to, the incoming sound corresponding to the transmitter of the incoming call is output through operations of the switch.

In the foregoing, a preferable mode is one wherein the switch is so configured as to have a function of, when the incoming call that arrived two or more times while the foldable portable cellular phone was folded has not been responded to, outputting the incoming sound corresponding to a transmitter of the incoming call that arrived several incoming calls before, through operations of signals each corresponding to each of operations of the switch performed two or more times to be input to the control section based on control by the control section.

Also, a preferable mode is one wherein the lid body or the main body is provided with a detecting unit used to detect an opening and closing state of the lid body, wherein, when the lid body is opened, a detection signal is fed to the control section from the detecting unit to make invalid the incoming call history information stored in the control section.

Also, a preferable mode is one wherein the incoming sound is produced by a ringer generator.

Also, a preferable mode is one wherein vibration is employed instead of the incoming sound.

Also, a preferable mode is one wherein vibration is employed in addition to the incoming sound.

Also, a preferable mode is one wherein a registered name corresponding to a transmitter of an incoming call which is registered on the telephone information registering unit and which is output from a ringer generator is employed instead of the incoming sound.

Furthermore, a preferable mode is one wherein time stored in the incoming call history storing area is employed in addition to the incoming sound.

With the above configurations, since the foldable portable cellular phone has the telephone information registering unit on which a plurality of kinds of incoming sounds each being assigned so as to be associated with each of a plurality of transmitters of incoming calls expected to be transmitted is pre-registered, the control section used to store, when the incoming call that arrived while the portable cellular phone was folded has not yet been responded to, incoming call history information about the transmitter, into the incoming call history storing area and the switch having the function of searching for the incoming call history storing area in the telephone information registering unit and in the control unit and of outputting the incoming sound corresponding to the transmitter of the incoming call and further, since the foldable portable cellular phone is so configured that, when the incoming call that arrived while the portable cellular phone was folded has not yet been responded to, the incoming sound corresponding to the transmitter of the incoming call is output by the operation of the above switch, the transmitter of the incoming call can be identified without need for seeing contents displayed

on the display device. Therefore, even in a state in which contents displayed on the display device cannot be viewed, the transmitter of the incoming call to which a response has not yet been made can be easily identified.

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BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, advantages, and features of the present invention will be more apparent from the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a schematic perspective view of an appearance of a foldable portable cellular phone according to a first embodiment of the present invention;

Fig. 2 is a schematic side view of the appearance of the foldable portable cellular phone according to the first embodiment and a third embodiment of the present invention;

Fig. 3 is a schematic block diagram describing configurations of the foldable portable cellular phone according to the first embodiment of the present invention;

Fig. 4 is a diagram explaining an operation principle of the foldable portable cellular phone according to the first embodiment of the present invention;

Fig. 5 is a flowchart explaining operations of the foldable portable cellular phone according to the first embodiment of the present invention;

Fig. 6 is a flowchart explaining operations of a foldable portable cellular phone according to a second embodiment of the present invention;

Fig. 7 is a schematic block diagram describing configurations of a foldable portable cellular phone according to a fourth embodiment of the present invention;

Fig. 8 is a schematic block diagram describing configurations of a foldable portable cellular phone according to a fifth embodiment of the present invention;

Fig. 9 is a schematic side view describing configurations of the foldable cellular phone according to the fifth embodiment of the present invention;

Fig. 10 is a schematic side view describing configurations of the foldable cellular phone according to the fifth embodiment of the present invention; and

Fig. 11A and Fig. 11B are schematic perspective views of an appearance of a conventional foldable portable cellular phone.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Best modes of carrying out the present invention will be described in further detail using various embodiments with reference to the accompanying drawings.

First Embodiment

Figure 1 is a schematic perspective view of an appearance of a foldable portable cellular phone according to a first embodiment of the present invention. Figure 2 is a schematic side view of the appearance of the foldable portable cellular phone according to the first embodiment. Figure 3 is a schematic block diagram describing configurations of the foldable portable

cellular phone according to the first embodiment. Figure 4 is a diagram explaining an operation principle of the foldable portable cellular phone according to the first embodiment. Figure 5 is a flowchart explaining operations of the foldable portable cellular phone according to the first embodiment. As shown in Fig. 1, the foldable portable cellular phone of the first embodiment is so constructed that its main body 1 is integrally connected to a lid body 2 through a hinge (not shown) and that the lid body 2 can be rotated around the hinge relative to the main body 1. The main body 1 has an incoming call lamp 3 and a transmitting and receiving antenna 5 configured so as to be freely expandable and contractible. The lid body 2 has a side key 4 with a function described later. Thus, Fig. 1 shows the appearance of one example of the foldable portable cellular phone in a folded state.

Moreover, as shown in Fig. 2, the foldable portable cellular phone of the embodiment has a magnet 21 in its main body 1 and a lead switch 22, in a position opposite to the magnet 21, in its lid body 2. These magnet 21 and lead switch 22 make up a detecting unit 23 in a pair. Since the lead switch 22 is turned ON and OFF in response to a distance to and from the magnet 21, an opening and closing state of the lid body 2 can be detected by the detecting unit 23. Each of the magnet 21 and the lead switch 22 may be mounted on either of the main body 1 or lid body 2.

The foldable portable cellular phone of the embodiment, as shown in Fig. 3, includes the transmitting and receiving antenna 5 used to transmit or receive a signal, a wireless section 6 used to modulate or demodulate a signal, a display section 7 made up of an LED (Light-Emitting Diode) device, a liquid crystal or a like used to display an operation content, a key operating section

8 containing a side key 4 used to input necessary information such as telephone information to a telephone directory memory 12, a control section 9 containing a CPU (Central Processing Unit) used to perform controlling operations on the entire components and to store a telephone call that arrived while the portable cellular phone was folded and has not yet been responded to, in an incoming call history storing area in a memory which stores incoming call history information about transmitters of incoming calls, a ringer generator 18 adapted to output an incoming sound by being driven by a ringer driving section 17 when the incoming call that arrived while the portable cellular phone was folded has not yet been responded to, a speaker 10 used to output a received voice, a microphone 11 used to input a voice to be transmitted and the telephone directory memory 12 on which the telephone information is pre-registered through operations of the key operating section 8.

The telephone directory memory 12 is so configured that telephone information made up of various pieces of data on a plurality of transmitters of incoming calls expected to be transmitted is pre-registered through operations of the key operating section 8. The telephone directory memory 12 includes a name memory 13 used to register names of the transmitters, a telephone number memory 14 used to register telephone numbers of the transmitters, an incoming sound memory 15 used to register incoming sound corresponding to the transmitter and a time memory 16 used to register the time of receiving the incoming call. That is, as shown in Fig. 4 as examples, both telephone numbers and incoming sounds each being assigned so as to be associated with each of the transmitters of the telephone call are set and registered

on the telephone directory memory 12. For example, an incoming sound A is associated with (1) Mr. Aka Satana, an incoming sound D with (4) Mr. Himi Rii and an incoming sound 2 with (11) Mr. Eke Setene. Thus, a plurality of kinds of incoming sounds each being assigned so as to be associated with each of a plurality of transmitters of the telephone calls is registered on the telephone directory memory 12. The incoming sound can be constructed by using, for example, kinds of melodies or kinds of tones, or by combining both.

Moreover, when incoming calls that arrived while the portable cellular phone was folded that have not yet been responded to, information about the history of the incoming calls including name of the transmitters of the incoming calls, telephone numbers, incoming sounds, times, or a like are stored in the incoming call history storing area in the memory installed in the control section 9.

The side key 4 of the key operating section 8 has a function by which, when the incoming call that arrived while the portable cellular phone was folded has not yet been responded to, when the side key 4 is pressed down, an operation signal from the side key 4 operation is input to the control section 9 which causes incoming call history information stored in the incoming call history storing area in the memory installed in the control section 9 and the telephone information stored in the telephone directory memory 12 to be searched for, based on control by the control section 9 and further, based on the search result, the ringer driving section 17 is driven to cause the ringer generator 18 to output an incoming sound corresponding to the transmitter of the telephone call. Therefore, when the incoming call that arrived while the portable

cellular phone was folded, by operating the side key 4 and based on control of the control section 9, the ringer generator 18 rings the incoming sound corresponding to the transmitter of the telephone call.

5 Next, operations of the foldable portable cellular phone of the embodiment will be described by referring to the flowchart in Fig. 5.

10 First, the user checks a state of the lid body 2 of the portable cellular phone (Step S101). In a state where the lid body 2 is opened, the content displayed on the display section 7 can be seen and therefore the routine is terminated. On the other hand, when the lid body 2 is folded, contents displayed on the display section 7 cannot be seen and therefore the routine proceeds to a next flow to check presence or absence of incoming calls (Step S102).

15 In the case of the absence of the incoming call, since no problem exists, the flow is terminated (Step S107). In the case of the presence of the incoming call, the user checks whether the incoming call has been responded to or not (Step S103). When the incoming call has been responded to, since speech has ended and
20 no problem exists and the flow is terminated accordingly. In the case of the absence of the response to the incoming call, that is, when the incoming call has not yet been responded to, the incoming call history information is stored in the incoming call history storing area in the memory installed in the control section 9 (Step
25 S104).

Next, whether the side key 4 is pressed down or not is checked (Step S105). When the side key 4 is not pressed down, the flow is terminated. When the side key 4 is pressed down, an incoming call corresponding to the transmitter of the incoming call, based

on the control of the control section 9, is input from the ringer generator 18 and the incoming sound rings (Step S106). Therefore, the user can identify the transmitter of the incoming call by hearing the incoming sound, without the need for seeing contents displayed on the display section 7.

As described above, according to the foldable portable cellular phone of the embodiment, since the user can identify a transmitter of an incoming call by hearing the incoming sound, without the need for seeing contents displayed on the display section 7, the user can be free from complicated processing in which the portable cellular phone has to be taken out from a pocket or a like every time the incoming call arrives and has to open the lid body 2 to see contents displayed on the display section 7 every time the incoming call arrives, which provides ease of use accordingly. Moreover, even if the user has visual impairment, since seeing contents displayed on the display section 7 is not required, the user can easily identify the transmitter of the telephone call.

Thus, since the foldable portable cellular phone of the embodiment includes the telephone directory memory 12 on which a plurality of kinds of transmitters of telephone calls is to be registered, the control section 9 used to store, when the incoming call that arrived while the portable cellular phone was folded has not yet been responded to, the incoming call history of the transmitter in the incoming call history storing area in the memory installed in the control section 9 and the side key 4 having functions of searching, when the incoming call that arrived while the portable cellular phone was folded has not yet been responded to, for the incoming call history storing area in the telephone directory

memory 12 and in the control section 9 and of causing the incoming sound corresponding to the transmitter to be output, and further, since the portable cellular phone, by operating the side key 4, when the incoming call that arrived while the portable cellular phone was folded has not yet been responded to, is adapted to output the incoming sound corresponding to the transmitter from the ringer generator 18, the user can identify the transmitter of the incoming call without the need for seeing contents displayed on the display section 7. Therefore, even in a state where contents displayed on the display device 7 cannot be seen, the user can easily identify the transmitter of the incoming call to which a response has not yet been made.

Second Embodiment

Figure 6 is a flowchart explaining operations of a foldable portable cellular phone according to a second embodiment. The foldable portable cellular phone of the second embodiment differs greatly from that in the first embodiment in that its side key 4 has a function of identifying a transmitter of an incoming call that arrived one incoming call before. That is, in the second embodiment, when incoming calls that arrived two or more times while the foldable portable cellular phone was folded have not yet been responded to, if the side key 4 is pressed down twice, each of operation signals induced by pressing of the side key 4 is input to a control section 9 and, based on the control of the control section 9, both incoming call history information stored in an incoming call history storing area in memory installed in the control section 9 and telephone information stored in a

telephone directory memory 12 are searched for and, further, based on a search result, a ringer driving section 17 is driven to cause a ringer generator 18 to output an incoming sound corresponding to the incoming call that arrived one incoming call before.

5 Therefore, when incoming calls that arrived two or more times while the portable cellular phone was folded have not yet responded to, by pressing down the side key 4 twice, based on the control of the control section 9, the incoming call responding to the incoming call that arrived one incoming call before is rang through
10 operations of the ringer generator 18.

 Next, operations of the foldable portable cellular phone of the second embodiment will be described by referring to the flowchart in Fig. 6. First, whether a user presses down the side key 4 or not is checked (Step S201). If the user does not press
15 down the side key 4, since there is no need for identifying the transmitter of then incoming call, the incoming sound does not ring (Step S204). When the side key 4 has been pressed down, whether the incoming call history information is stored in the incoming call history storing area in the memory installed on the control
20 section 9 is checked (Step S202).

 If the incoming call history information is not stored, since the incoming sound is not output, the flow is terminated (Step S204) accordingly. If the incoming call history information is stored, a sound of the incoming call that arrived one incoming
25 call before is rang through operations of the ringer generator 18 (Step S203). Next, whether the identification of the transmitter of the incoming call has been completed or not is judged (Step S205). If the identification of the transmitter has been completed, the flow is terminated. When the identification of the transmitter

has not been completed, the routine returns to Step S201 and the operations are repeated until the identification is completed.

Thus, in the second embodiment, the same effects as obtained in the first embodiment can be achieved. Additionally, according to the second embodiment, since the transmitter of the incoming call that arrived one incoming call before can be identified, even if the incoming calls that arrived two or more times while the portable cellular phone was folded have not yet been responded to, the transmitter of the incoming calls can be identified.

Third Embodiment

The foldable portable cellular phone of a third embodiment is so configured, as shown in Fig. 2, that a magnet 21 is embedded in a main body 1 and a lead switch 22 is embedded, in a position opposite to the magnet 21, in a lid body 2. The magnet 21 and the lead switch 22, in a pair, makes up a detecting unit 23. In the third embodiment, when the lid body 2 is opened, a control signal in response to an opening operation of the lid body 2 is input from the lead switch 22 to a control section 9 in order to reset incoming call history information stored in an incoming call history storing area in a memory installed on the control section 9, that is, to make the incoming history information invalid. This enables the incoming call history information stored in the incoming call history storing area in the memory installed on the control section 9 to be made invalid by simply opening the lid body 2, which allows the incoming call history storing area to be utilized effectively.

Thus, in the third embodiment, the same effects as obtained

in the first embodiment can be achieved. Additionally, simply by opening the lid body 2, the incoming call history information stored in the memory installed on the control section 9 can be easily reset.

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Fourth Embodiment

Figure 7 is a schematic block diagram describing configurations of a foldable portable cellular phone according to a fourth embodiment. Configurations of the foldable portable cellular phone of the fourth embodiment differ greatly from those in the first embodiment in that identification of a transmitter of an incoming call is performed by using vibration of a vibrator 20, instead of incoming calls. That is, in the embodiment, when the incoming call that arrived while the portable cellular phone was folded has not yet responded to, by operating a side key 4 (Fig.1), the vibrator 20 is driven, based on control by a control section 9, by a vibrator driving section 19 to cause the vibration corresponding to the transmitter of incoming calls to occur. In this case, as a method for generating the vibration corresponding to the transmitter of the incoming call by the vibrator 20, a method that has been implemented by vibration technology can be employed.

Thus, by identifying the transmitter of the incoming call using the vibration of the vibrator 20, the use of the portable cellular phone is made possible in a silent atmosphere in which ringing of such the incoming call causes inconvenience to other.

Therefore, in the fourth embodiment, the same effects as obtained in the first embodiment can be achieved. Additionally, since the transmitter of the incoming call can be identified, the

portable cellular phone can be used without causing inconvenience to others.

Fifth Embodiment

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Figure 8 is a schematic block diagram describing configurations of a foldable portable cellular phone according to a fifth embodiment of the present invention. The foldable portable cellular phone of the fifth embodiment differs greatly from that of the first embodiment in that two kinds of systems are provided to identify a transmitter of an incoming call. That is, in the fifth embodiment, by taking note of a fact that the incoming call includes not only a telephone call but also E-mail (electronic mail) as shown in Fig. 8, a first identifying unit 10 25 made up of a combination of a ringer driving section 17 and a ringer generator 18 to identify the transmitter of the incoming telephone call and a second identifying unit 26 made up of a combination of a vibrator driving section 19 and a vibrator 20 to identify the transmitter of the E-mail are provided.

20 In this case, as shown in Fig. 9, a lid body 2 is so configured to have a first side key 27 used to operate the first identifying unit 25 and a second side key 28 used to operate the second identifying unit 26. These first and second side keys 27 and 28 may have functions opposite to each other, that is, the first side key 27 may operate the second identifying unit 26 and the second side key 28 may operate the first identifying unit 25. Moreover, a slide key 29, as shown in Fig. 10, may be mounted on the lid body 2. The slide key 29 can be so configured that it can have the same function as the above first side key 27 if the slide key 25

29 is slid, for example, toward an A direction and it can have the same function as the above second side key 28 if the slide key 29 is slid, for example, toward a B direction. The first and second side keys 27 and 28 or the slide key 29 may be mounted not only on the lid body 2 but also on a main body 1.

According to the configurations of the fifth embodiment, when the first identifying unit 25 is selected, the ringer generator 18 is driven, thus enabling the incoming telephone call to be checked easily. When the second identifying unit 26 is selected, the vibrator 20 is driven, enabling the incoming E-mail to be easily checked.

Thus, in the fifth embodiment, the same effects as obtained in the first embodiment can be achieved. Additionally, in the fifth embodiment, since two kinds of systems to identify the transmitter are provided, two types of incoming signal information can be checked.

It is apparent that the present invention is not limited to the above embodiments but may be changed and modified without departing from the scope and spirit of the invention. For example, in the above second embodiment, the incoming call that arrived one incoming call before is checked. However, the side key 4 may have functions of checking the incoming call that arrived several incoming calls before, that is, incoming calls that arrived two or more incoming calls before. Moreover, the two kinds of systems including the ringer driving section 17 / ringer generator 18 and the vibrator driving section 19 / vibrator 20 provided in the fifth embodiment may be so configured that either of these two systems may identify the transmitter of either of the incoming telephone call or the E-mail.